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CHEMICAL & ENGINEERING NEWS

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Chemical Plant Capacity Use Continues Comeback

Capacity utilization rate for basic chemicals rose to 72%, for plastics to 81%; polymers at 81% again had highest use rate though down slightly from the third quarter

William J. Storck, C&EN New York
Bruce F. Greek, C&EN Houston

The U.S. chemical industry, after a long economic letdown, is getting itself back into shape. Sales and earnings are up strongly from a year ago, and profitability has increased from its recession low. And now rising demand—especially for organics—is boosting capacity utilization, a key measure of the industry's vitality and one used for planning capital improvements for years to come.

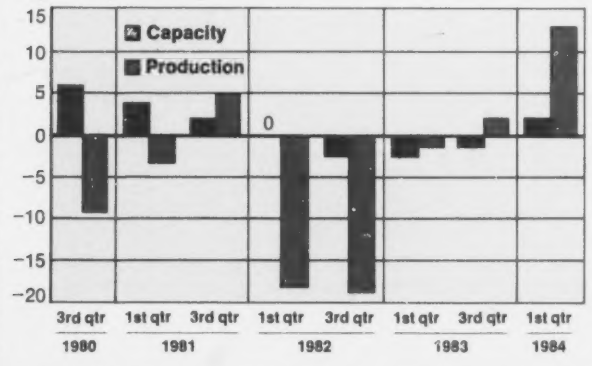
In the recent past, plant capacity use rates have been so low that there has been no need to build new plants. Even now, utilization rates continue low for the industry as a whole, on a historic basis, but C&EN's latest semiannual survey of capacity utilization shows considerable tightness in some basic chemical product lines.

Specifically, the survey of 32 basic chemicals and 11 downstream polymers shows that in this year's first quarter capacity use for basic chemicals increased to an unweighted average of 72% from 68% in the third quarter of 1983. Within this group, organics capacity use climbed to 74% from 68% six months ago. Capacity use for inorganics increased to an average of 68% from 66%.

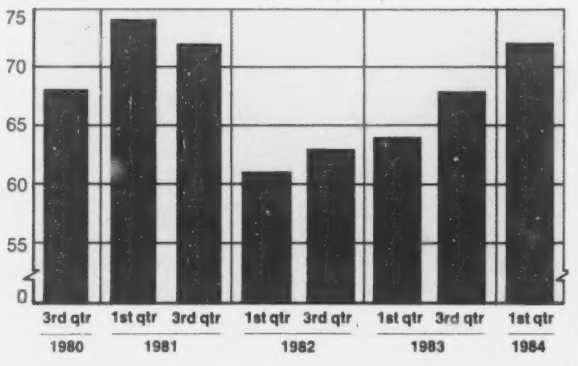
As in the previous survey, polymers again showed overall the highest capacity utilization rates, with plants running at about 81% of nameplate capacity. However, this was down slightly from 82% in the third quarter of 1983. Of this category, capacity use for major plastics rose to 81% from 79% six months ago, and use rates for fibers fell to 81% from 85%.

After factoring in various operating inefficiencies, including plant shutdowns for routine maintenance, effective capacity use rates for basic chemicals in-

Chemical production has jumped and plant capacity is up moderately . . .



. . . causing capacity use rates to continue climb from 1982 low



Sources: Industry and government data, C&EN estimates for 32 leading chemicals

Capacity utilization moved up moderately for basic chemicals in first-quarter 1984

Billions of lb unless otherwise noted[a]	First-quarter 1984			Third-quarter 1983			First-quarter 1983		
	Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use	
		Nameplate	Effective		Nameplate	Effective		Nameplate	Effective
Petrochemicals—olefins and aromatics[b]									
Ethylene	36.5	82%	91%	38.4	74%	82%	39.0	67%	74%
Propylene (chemical and polymer)	23.0	59	65	23.0	61	68	23.0	49	54
Butadiene[c]	4.5	51	56	4.5	58	64	4.5	37	41
Benzene (bg)	2.4	51	57	2.3	60	67	2.3	43	48
***p*-Xylene**	4.9	85	100	4.9	93	98	4.9	68	72
Petrochemicals—C_1 derivatives									
Ammonia (mt)[b]	17.8	88	91	18.7	64	67	18.7	71	75
Urea (mt)[b]	7.8	83	92	7.8	59	66	7.8	73	81
Methanol (bg)	1.9	60	67	1.8	63	70	1.7	56	62
Formaldehyde	9.2	56	59	9.2	56	59	9.2	55	58
Chlor-alkalies									
Chlorine (mt)[b]	13.4	72	76	14.5	70	74	14.4	67	71
Caustic soda (mt)[b]	14.3	68	72	15.5	66	70	15.4	66	69
Soda ash (mt)	11.0	77	81	10.7	81	85	10.7	74	78
Acids									
Sulfuric (mt)[b]	58.0	66	69	57.5	52	55	57.5	59	62
Phosphoric (P_2O_5, mt)[b,d]	12.5	82	86	12.5	66	69	12.5	71	75
Industrial gases									
Oxygen, **Nitrogen** (total, liquid, ttd)	39.4	61	75	40.0	64	78	37.0	64	78
Carbon dioxide (ttd)[e]	19.0	67	74	19.6	64	70	18.9	61	68
Mineral-based inorganics[b]									
Sulfur (total, mmt)	17.0	31	—	16.0	50	—	15.5	48	—
Potash (mt)	2.2	55	—	2.2	50	—	2.2	86	—
Phosphorus	0.55	67	70	0.55	67	71	0.55	65	69
Plastics intermediates									
Styrene	7.8	92	108	8.1	77	91	8.2	64	75
Vinyl chloride	10.0	54	61	9.3	79	87	10.1	65	72
Toluene diisocyanate	0.70	102	113	0.70	83	92	0.70	94	104
Fiber intermediates									
DMT-PTA[f]	7.6	82	97	7.6	80	94	7.3	64	75
Ethylene oxide	7.4	84	93	7.3	75	84	7.3	76	84
Cyclohexane[b]	3.4	62	66	3.4	52	55	3.4	31	33
Adhesives, coatings intermediates									
Phenol	3.3	85	94	3.3	83	92	3.6	64	71
Vinyl acetate	2.4	87	92	2.4	83	88	2.4	90	95
Pigments									
Carbon black	3.3	86	96	3.3	73	81	3.3	63	70
Titanium dioxide	0.90	84	98	0.91	86	100	1.0	60	71
Solvents									
Acetone	2.8	67	75	3.0	67	74	3.3	57	63
Ethanol (mg)	240.0	78	91	240.0	59	62	240.0	72	76
Methylene chloride	0.80	69	77	0.83	71	79	0.83	59	66
AVERAGE		**72%**	**82%**		**68%**	**76%**		**64%**	**70%**

a bg = billions of gallons, mt = millions of tons, tt = thousands of tons, ttd = thousands of tons per day, mmt = millions of metric tons, mg = millions of gallons. b Substantial capacity currently shut down. c Total extraction capacity, which runs about 25% more than basic production capacity. d Includes both wet-process and furnace-process capacity. e Excludes oilfield operations. f Dimethyl terephthalate and DMT equivalents of purified terephthalic acid. **Sources:** Industry and government sources, C&EN estimates

creased to 82% from 76%, but for polymers declined to 88% from 89%. Effective capacity is usually 5 to 15% lower than nameplate capacity.

During the recession most chemical companies worked hard to lower their break-even points on plant operations by upgrading and modernizing production lines and generally streamlining operations. As a result, the current increase in capacity utilization rates gives the companies a great amount of earnings leverage, with profits increasing faster than sales.

For instance, at Du Pont's annual meeting earlier this month, chairman Edward G. Jefferson said, "Effective cost reduction programs including process

Polymer capacity use is down slightly in first-quarter 1984

Billions of lb per year	First-quarter 1984 Capacity (nameplate)	First-quarter 1984 Capacity use Nameplate	First-quarter 1984 Capacity use Effective	Third-quarter 1983 Capacity (nameplate)	Third-quarter 1983 Capacity use Nameplate	Third-quarter 1983 Capacity use Effective	First-quarter 1983 Capacity (nameplate)	First-quarter 1983 Capacity use Nameplate	First-quarter 1983 Capacity use Effective
PLASTICS									
Polyethylene, low density	10.1	83%	88%	10.1	81%	86%	10.1	74%	79%
Polyvinyl chloride	8.3	78	92	8.9	71	83	8.9	55	64
Polyethylene, high density	6.8	87	91	6.3	94	99	6.3	85	89
Polypropylene	5.3	90	100	5.1	86	96	5.1	83	92
Polystyrene[a]	5.1	67	78	5.3	64	75	5.3	55	65
AVERAGE		**81%**	**90%**		**79%**	**88%**		**70%**	**78%**
SYNTHETIC FIBERS									
Filament yarn									
Polyester	1.5	84	90	1.6	88	93	1.6	83	88
Nylon	1.9	85	92	1.9	84	90	1.9	64	68
Olefin	1.1	63	67	1.1	71	75	1.0	48	51
Staple									
Polyester	2.8	82	87	2.7	89	95	2.7	75	80
Nylon	0.99	89	95	0.99	96	102	0.98	81	86
Acrylic	0.83	83	88	0.83	83	88	0.83	77	82
AVERAGE		**81%**	**86%**		**85%**	**91%**		**71%**	**76%**
OVERALL AVERAGE		**81%**	**88%**		**82%**	**89%**		**71%**	**77%**

a Between 5 and 10% of this capacity shut down. **Sources:** Industry sources, Society of the Plastics Industry, Textile Economics Bureau, C&EN estimates

modernization and productivity improvements contributed to earnings growth in 1983. These improvements give us excellent upside potential as capacity utilization rates continue to improve."

And Monsanto president and chief executive officer Richard J. Mahoney says that the asset management and restructuring programs of the past few years at his company brought significantly improved margins at higher production levels.

The industry's capacity situation may be much tighter than is indicated by the figures in the most recent survey. There is a large amount of capacity that remains shut down, but that is still included in C&EN's survey. This has happened for the simple reason that this shut-down capacity is still officially available for production if demand warrants it. For instance, at least 5% of U.S. nameplate capacity for ethylene remains closed from the recession, but it is as yet unknown how much of it may never again be restarted. Other chemicals in a similar situation include propylene, butadiene, benzene, ammonia, urea, chlorine, caustic soda, sulfuric acid, styrene, and methanol.

In methanol, Celanese's Clear Lake, Tex., plant has been closed since January and probably will be replaced at some time in the future by imports from Canada and Saudi Arabia. However, as of now, Celanese still lists the plant as operable and has not announced a permanent shutdown, so the plant is included in the survey.

The capacity utilization rate for basic chemicals of 72% for the first quarter is very close to the Federal Reserve Board's seasonally adjusted theoretical capacity utilization rate for chemicals and allied products of 71.4% in the first quarter, down from 72.1% in the fourth quarter of 1983 and the same as the 71.4% registered in the third quarter.

C&EN figures are closer to reality, however, as more companies announce permanent shutdowns of their plants and as more capacity that was closed temporarily is brought back on stream to supply increased demand. Oddly enough, the capacity that has been put back on line just about equals capacity that was closed down permanently in the first quarter. Thus, total capacity for the 32 basic chemicals in the survey has remained fairly constant since the third quarter.

Of the 32 products on the basic chemical list, 17 of them have seen changes in capacity since the third quarter. Of these, capacity has declined for 10 and increased for seven.

The largest decreases were 7.7% and 7.6% for caustic soda and chlorine, respectively, and 6.7% for acetone. The largest increase was a 7.5% jump in vinyl chloride capacity, fueled by increased demand for downstream polymer polyvinyl chloride. Other increases were 6.3% for sulfur, 5.6% for methanol, and 4.3% for benzene.

The survey also shows that, unfortunately, capacity use for basic olefins and aromatics, which have a large effect on industry profits, dropped to 66% in the first quarter from 69% in third-quarter 1983, in spite of some capacity trimming. Only ethylene showed an increase in capacity use during the period, rising to 82% of nameplate capacity in the first quarter from 74% six months earlier. Capacity use for the other four chemicals—propylene, butadiene, benzene, and *p*-xylene—all declined, with the biggest drops for butadiene, to 51% from 58%, and for benzene, to 51% from 60%.

C&EN capacity use indicator: the ground rules

Capacity use at chemical plants is difficult to measure and requires certain assumptions. These bring some order to the maze of variables affecting this critical indicator of the industry's health.

With the help of industry and government sources, C&EN measures capacity use as a percentage of both nameplate and effective maximums. Nameplate capacity is the official design capacity of plants. Effective capacity is the practical maximum after reductions for unplanned maintenance, corrosion problems, changes in product mix, and other influences. Although engineering companies and industry statistics groups try to make nameplate capacity data as real as possible, practical problems almost always reduce effective maximums to 85 to 95% of the official totals. For short periods, plants can run at more than 100% of effective top capacity, but such a rate doesn't last more than a few months.

Capacity use is given over as much of a calendar quarter as production data permit, with no seasonal adjustment. The figures are for plants actually operable. At present, some products such as ethylene, ethanol, chlorine, polystyrene, ammonia, and urea have plants temporarily shut down because of weak markets. These plants still are included in capacity totals. The totals exclude new plants just starting up and old plants out of operation for long periods because of accidents. As much as possible, capacity figures stay current with expansions.

Capacity data don't take into account other temporary fluctuations for fuel and electric power interruptions, equipment failure, and feedstock scarcity or substitution. The feedstock variables, for example, have been important in the past few years in ethylene production, altering maximum output for several coproducts such as propylene, butadiene, and benzene.

Products in C&EN's capacity use survey are the same as those in the Key Chemicals and Key Polymers series. These are the core products of the industry, the building blocks leading to downstream production of thousands of more specialized products.

On the other hand, capacity use for C1 petrochemicals showed a healthy increase to 72% from 61% as demand for agricultural chemicals picked up. This pickup also is evident in a gain to 88% capacity use for ammonia from 64%, and to 83% for urea from 59%. Of the other two chemicals in the C1 category, methanol's capacity use dropped slightly to 60% from 63%, and formaldehyde's remained a constant 56%.

The highest average capacity utilization for any group of the basic chemicals surveyed was for adhesives and coatings intermediates, which increased to 86% in the first quarter from 83% six months before. Within the group, capacity use for vinyl acetate increased to 87% and phenol to 85%, both from 83% in third-quarter 1983.

Next highest was for the pigments group, average capacity utilization for which rose to 85% from 80%. In this group, carbon black's capacity use increased to 86% from 73%, but titanium dioxide's fell to 84% from 86%.

Plastic intermediates also posted a relatively high capacity utilization, increasing to 83% of nameplate capacity from 80% in last year's third quarter. In this group, styrene capacity use rose to 92% from 77%, vinyl chloride's fell to 54% from 79% as additional capacity was brought on stream, and toluene diisocyanate's increased to 102% from 83%, indicating that TDI makers continue their traditional practice of understating production capacity possibly as much as 20%.

Other groups with above-average capacity utilization include the fiber intermediates, which increased to 76% from 69%, and the big acids, which rose to 74% from 59%, largely on the strength of phosphoric acid.

Groups within those chemicals surveyed whose capacity use was about average include, in addition to the C1 petrochemicals, the chlor-alkalies, which stayed at 72%, and solvents, which increased to 71% from 66%.

Those below the average, in addition to the olefins and aromatics, included industrial gases, whose capacity use remained at 64%, and the mineral-based inorganics, whose capacity utilization dropped to 51% from 56% on an increase in sulfur capacity that was not made up by an increase in production. Capacity use for sulfur fell to 31% from 50% during the period.

Despite the one percentage point decline in average capacity utilization for downstream polymers, they remained the bright spot for chemical producers. The major plastics increased capacity use to an average of 81% from 79% in the surveyed period. All of the major plastics, with the exception of high-density polyethylene, had increases in capacity utilization. That for low-density polyethylene increased to 83% from 81%, and that for PVC rose to 78% from 71%, largely because of declining capacity.

Polypropylene was the stellar plastic with capacity utilization up to 90% from 86%, and polystyrene the laggard with an increase to 67% from 64%. Only high-density polyethylene showed a decline, with utilization rates dropping to a still-above-average 87% from 94%.

While most plastics' use rates were rising, those for fibers were dropping. Capacity utilization for the major synthetic fibers fell to 81% in the first quarter from 85% in last year's third quarter.

Among the fibers, by construction, filament yarn fared worst, with capacity utilization falling to 77% from 81%. This low use rate was strongly influenced by a drop in olefins to 63% from 71%. Staple types fared much better, but still dropped to 85% from 89%. Only nylon filament showed an increase in use rates, rising to 85% in the first quarter from 84% in last year's third quarter. Acrylic capacity use remained at 83%. □

Chemical Stocks Follow Market Down

Index of chemical stocks, currently below level of a year ago, is doing only slightly better than overall stock market

David Weber, C&EN New York

It was just about a year ago that chemical stocks began charging ahead of the rest of the stock market. Riding a wave of optimistic earnings forecasts by analysts, prices of chemical shares, as measured by C&EN's chemical stock index, stood in September at 133% of their value at the beginning of 1983. The Dow Jones Industrial Average, by comparison, had risen only to 116% of its January 1983 level.

Those glory days are just fond memories now. When the stock market crested in mid-January, having run up against fears of the big federal budget deficit and higher interest rates, the chemical stock group corrected itself even more severely. Between the middle of January and the middle of February, for example, the Dow Jones average plunged 9.5%. During the same period, the chemical stock index dived a little more than 13%.

It was an abrupt return to Earth for the high-flying chemical stocks. Since February, the C&EN index has risen some 7%, but at the middle of May was still lower than its level in May 1983.

The C&EN index—based on the stock prices of Allied, American Cyanamid, Celanese, Dow Chemical, W. R. Grace, Monsanto, and Union Carbide—is not only lower than it was last year at this time, but a broader sample consisting of 29 major chemical company stocks shows the same trend. In the larger group, the price of a share of common stock is lower in 21 cases than it was in May 1983.

Of the major chemical companies, the best stock issue over the past 12-month period has been Celanese. In a year of overall recovery for the fibers and chemicals company, which increased its earnings 633% between the first quarter of 1983 and the first quarter of 1984, the price of a share of common stock rose nearly 24% to reach $73 recently. The only other chemical stock to grow to an extent anywhere near that over the past year has been Morton Thiokol, which has risen from $62½ last May to $76 recently, an increase of 22%.

The only other winners in the year-to-year comparison are Monsanto, whose common stock price rose 13% during the period to close at $92½ recently; Allied, whose stock price rose 6.2% over the span to $51¼; Du Pont, up 5.8% to $48; Ethyl, up 4.5% to $20⅜; and American Cyanamid, up 1.3% to $49⅞.

The worst performers in the year-to-year comparison of common stock prices are Stauffer Chemical—whose earnings have been hit hard over the past several quarters by first the slump in the corn herbicide market and then its slowness to recover—down 24% over the period to close recently at $18; First Mississippi, down 22% to $9¼; Union Carbide, whose earnings recovery has been lagging much of the rest of the chemical industry, down 19% to $55⅝; Hercules, down 18% to $31⅜; and W. R. Grace, down 17% to $39.

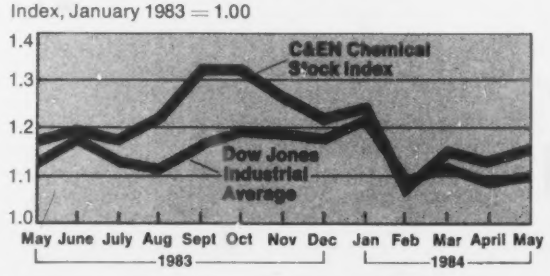
The extent of this return to averageness on the part of chemical

Chemical stocks have fallen more than other industrial indexes. . .

	May 18, 1984	May 20, 1983	% change
C&EN Chemical Stock Index[a]	250	254	−1.6%
Dow Jones Industrial Average	1157.14	1190.02	−2.8
New York Stock Exchange Composite	91.23	93.71	−2.6
New York Stock Exchange Industrials	107.17	108.33	−1.1
American Stock Exchange Index	209.21	224.81	−6.9
Over-the-Counter Composite	250.57	303.56	−17.5
Over-the-Counter Industrials	282.45	366.38	−22.9
Standard & Poor's 500	158.49	162.14	−2.3
Standard & Poor's 400 Industrials	179.51	181.78	−1.2

a C&EN index based on stock prices for Allied, American Cyanamid, Celanese, Dow Chemical, W. R. Grace, Monsanto, and Union Carbide.

. . . and are no longer outperforming the stock market by very much



Note: Both indexes reindexed to January 1983 = 1.00 to make comparable. Based on mid-month stock data.

Many chemical stocks are lower than a year ago

	Stock price				Per cent change			Price/earnings ratio May 18	Annual indicated dividend	Dividend yield, % of price
	May 18, 1984	May 20, 1983	12-month low	12-month high	From one year ago	From low	From high			
Air Products	$42¾	$42¾	$36½	$51	0.0%	17.1%	−16.2%	10	$1.00	2.3%
Allied	51¼	48¼	47¼	58⅛	6.2	8.5	−11.8	9	2.40	4.7
American Cyanamid	49⅞	49¼	42⅛	59	1.3	18.4	−15.5	12	1.90	3.8
Celanese	73⅛	59⅛	58⅛	79¾	23.5	25.6	−8.5	8	4.00	5.5
Chemed	33¼	35½	27¾	40	−6.3	19.8	−16.9	14	1.48	4.5
Dow Chemical	30¾	32¼	27⅛	38⅜	−4.7	13.4	−19.9	17	1.80	5.9
Du Pont	48	45⅜	42⅜	55	5.8	13.3	−12.7	9	2.80	5.8
Essex Chemical	22⅞	26⅞	17	28½	−14.9	34.6	−19.7	20	0.80	3.5
Ethyl	20⅜	19½	19	29¾	4.5	7.2	−31.5	8	0.85	4.2
First Mississippi	9¼	11⅞	8¾	15½	−22.1	5.7	−40.3	16	0.24	2.6
Freeport-McMoRan	20½	23⅛	18⅝	27⅜	−11.4	9.8	−25.1	16	0.60	2.9
W. R. Grace	39	47⅛	38⅜	50⅜	−17.2	1.6	−22.6	11	2.80	7.2
Hercules	31⅜	38⅜	28¾	43⅛	−18.2	9.1	−27.2	9	1.44	4.6
International Flavors	26	27½	23⅝	35⅜	−5.5	9.8	−27.3	14	1.08	4.2
International Minerals	35¾	42⅞	36	49	−16.6	−0.7	−27.0	10	2.60	7.3
Loctite	32¼	38⅜	32	46½	−16.0	0.8	−30.6	13	0.68	2.1
Lubrizol	19⅝	20⅞	18¼	27⅞	−5.7	7.8	−29.4	12	1.08	5.5
Monsanto	92½	81⅝	80	116⅜	13.3	15.6	−20.5	9	4.60	5.0
Morton Thiokol	76	62½	60	84½	21.6	26.7	−10.1	12	1.76	2.3
Nalco Chemical	24⅜	29¼	23⅜	37	−16.7	4.3	−34.1	13	1.20	4.9
National Distillers	27¾	28⅝	24¼	31	−3.2	14.4	−10.5	13	2.20	7.9
Olin	28⅛	30¼	25⅛	34	−7.0	11.9	−17.3	9	1.32	4.7
Pennwalt	35¼	40½	33¼	45¾	−13.0	6.0	−23.0	10	2.20	6.2
PPG Industries[a]	27¾	64⅛	27⅛	38	−56.7	2.3	−27.0	7	1.44	5.2
Reichhold Chemicals	27¼	28	25⅛	38⅞	−2.7	8.5	−29.9	9	0.60	2.2
Rohm & Haas	60½	115½	49½	81	−47.6	22.2	−25.3	10	1.60	2.6
Stauffer Chemical	18	23⅝	17½	31¾	−24.0	2.9	−43.3	—	1.44	8.0
Union Carbide	55⅝	68⅝	52	73⅞	−18.9	7.1	−24.6	29	3.40	6.1
Witco Chemical	32	39¼	26⅛	39½	−18.5	22.5	−19.0	8	1.32	4.1

a Adjusted for stock split.

stocks in general is readily apparent in a comparison of how C&EN's chemical stock index stood relative to other major stock market measures in January, when the stock market correction was beginning, and now. For instance, at that point, the chemical stock index had risen almost 22% over the previous 12 months, an increase above the Dow Jones Industrial Average, the New York Stock Exchange Composite, the New York Stock Exchange Industrials, the Over-the-Counter indexes, and the Standard & Poor's indexes. Only the American Stock Exchange index, up 24%, had done better.

Now, the chemical stock index's 12-month performance fits right in with that of most of the rest of the stock market. Although the C&EN measure has declined less over the past year than the Dow Jones average, the New York Stock Exchange Composite index, and the Standard & Poor's 500, it has done worse than the New York Stock Exchange Industrials index and the Standard & Poor's 400 Industrials.

Over the same period, the American Stock Exchange index has declined 6.9%, the Over-the-Counter Composite index has declined about 18%, and the Over-the-Counter Industrials has declined 23%.

Another sign of the chemical industry's stock market problems is that recent common stock prices tend to be closer to the low end of the share's 12-month price range than to the high end. In the 29-stock group, in fact, only four companies' shares are selling at prices above the midpoint of their one-year range. Those firms are Celanese, Essex Chemical, Morton Thiokol, and National Distillers.

Meanwhile, a number of companies are trading close to the bottom of their 12-month price range. Most noticeable are the specialty chemical producers: Loctite, at $32¼ recently, barely above its 12-month low of $32; Lubrizol, at $19⅝, near its low of $18¼; and Nalco Chemical, at $24⅜, compared to a low of $23⅜.

The chances for a chemical stock rally depend, on the one hand, on the ability of companies to make real their mostly optimistic earnings forecasts for the year, and, on the other hand, the unpredictable movement of interest rates and inflation. The huge federal budget deficit is still sparking predictions of woe from many quarters. In this climate of uncertainty, the stock market, which fell more than 23 points between May 14 and 18, shows little sign of a general rally soon. □